CLAIMS

1. An image interpolating device comprising:

a color filter having a first row, in which red (R) and green (G) color filter elements are alternately aligned in the horizontal direction, and a second row, in which G and blue (B) color filter elements are alternately aligned in the horizontal direction, said second row being adjacent to the upper or lower side of said first row;

an imaging device that generates first R, G, and B-signals which are pixel signals corresponding to said color filter elements;

a pattern-setting processor that extracts images belonging to a first pattern, in which a pixel having said first R-signal is positioned at the upper-left corner of a 2 x 2 pixel matrix, a second pattern, in which a pixel having said first G-signal is positioned at the upper-right corner of said 2 x 2 pixel matrix, a third pattern, in which a pixel having said first G-signal is positioned at the lower-left corner of said 2 x 2 pixel matrix, and a fourth pattern, in which a pixel having said first B-signal is positioned at the lower-right corner of said 2 x 2 pixel matrix, from said first R, G, and B-signals generated by said imaging device;

a G-interpolation processor that, regarding first and fourth objective pixels contained in said images belonging to said first and fourth patterns, obtains a second G-signal by utilizing said first G-signals of pixels adjacent to said first or fourth objective

pixel;

an R/B-interpolation processor that, regarding second and third objective pixels contained in said images belonging to said second and third patterns, obtains second R and B-signals by utilizing said first R and B-signals of pixels adjacent to said second and third objective pixels;

a B-interpolation processor that extracts a first similar pixel which has the closest luminance value to that of said first objective pixel, from pixels adjacent to said first objective pixel, and obtains a third B-signal based on first information of said first similar pixel; and

an R-interpolation processor that extracts a second similar pixel which has the closest luminance value to that of said fourth objective pixel, from pixels adjacent to said fourth objective pixel, and obtains a third R-signal based on second information of said second similar pixel.

2. A device according to claim 1, wherein said first information comprises a luminance value and a color difference signal Cb of said first similar pixel, and said second information comprises a luminance value and a color difference signal Cr of said second similar pixel.

3. A device according to claim 1, wherein said first information comprises color difference signals Cb and Cr, and said second information comprises color difference signals Cb and Cr.

4. A device according to claim 1, wherein said pixels, which

are adjacent to said first and fourth objective pixels and which are utilized in said G-interpolation processor, are contained in said images belonging to said second and third patterns.

5. A device according to claim 1, wherein said pixels, which are adjacent to said second and third objective pixels and which are utilized in said R/B-interpolation processor, are contained in said images belonging to said first and fourth patterns.

6. A device according to claim 1, wherein said pixels, which are adjacent to said first and fourth objective pixels and which are utilized in both said B-interpolation processor and said R-interpolation processor, are contained in said images belonging to said second and third patterns.

7. A device according to claim 1, wherein said B-interpolation processor and said R-interpolation processor respectively extract said first and second similar pixels, using said first G-signals of said pixels adjacent to said first and fourth objective pixels.

8. A device according to claim 2, wherein said B-interpolation processor obtains said third B-signal, on the assumption that said color difference signal Cb of said first objective pixel is equal to said color difference signal Cb of said first similar pixel.

9. A device according to claim 2, wherein said R-interpolation processor obtains said third R-signal, on the assumption that said color difference signal Cr of said fourth objective pixel is equal to said color difference signal Cr of said second similar pixel.

10. A device according to claim 2, wherein said B-interpolation

processor obtains said third B-signal, using said color difference signal Cb and a modified luminance value which is obtained by multiplying said luminance value by a ratio of said second G-signal of said first objective pixel and said first G-signal of said first similar pixel.

11. A device according to claim 10, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cb=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

$$YG=Y \times G(x,y)/G(x',y')$$

$$b=YG+1.772 \times Cb$$

wherein Y is a luminance value of said first similar pixel, R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said first similar pixel, G(x,y) is said second G-signal of said first objective pixel, b is said third B-signal obtained by said B-interpolation processor, and YG is said modified luminance value.

12. A device according to claim 2, wherein said R-interpolation processor obtains said third R-signal, using said color difference signal Cr and a modified luminance value which is obtained by multiplying said luminance value by a ratio of said second G-signal of said fourth objective pixel and said first G-signal of said second similar pixel.

13. A device according to claim 12, wherein said R-interpolation

processor obtains said third R-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

$$YG=Y \times G(x,y)/G(x',y')$$

$$r=YG+1.402 \times Cr$$

wherein Y is a luminance value of said second similar pixel, R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said second similar pixel, G(x,y) is said second G-signal of said fourth objective pixel, r is said third R-signal obtained by said R-interpolation processor, and YG is said modified luminance value.

14. A device according to claim 1, wherein said B-interpolation processor extracts said first similar pixel, using said first G-signal and said second R-signal of said pixels adjacent to said first objective pixel.

15. A device according to claim 1, wherein said R-interpolation processor extracts said second similar pixel, using said first G-signal and said second B-signal of said pixels adjacent to said fourth objective pixel.

16. A device according to claim 2, wherein said B-interpolation processor obtains said third B-signal, using said color difference signal Cb and a modified luminance value which is obtained by multiplying said luminance value by a ratio of a first reference value, which is obtained based on said second G-signal and said

first R-signal of said first objective pixel, and a second reference value, which is obtained based on said first G-signal and second R-signal of said first similar pixel.

17. A device according to claim 16, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cb=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

$$YG=Y \times (0.587 \times G(x,y)+0.299 \times R(x,y))/(0.587 \times G(x',y')+0.299 \times R(x',y'))$$

$$b=YG+1.772 \times Cb$$

wherein Y is a luminance value of said first similar pixel, R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said first similar pixel, G(x,y) is said second G-signal of said first objective pixel, b is said third B-signal obtained by said B-interpolation processor, and YG is said modified luminance value.

18. A device according to claim 2, wherein said R-interpolation processor obtains said third R-signal, using said color difference signal Cr and a modified luminance value which is obtained by multiplying said luminance value by a ratio of a first reference value, which is obtained based on said second G-signal and said first B-signal of said fourth objective pixel, and a second reference value, which is obtained based on said first G-signal and said second B-signal of said second similar pixel.

19. A device according to claim 18, wherein said R-interpolation processor obtains said third R-signal, according to the following formula.

$$Y=0.299 \times R(x',y')+0.587 \times G(x',y')+0.114 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

$$YG=Y \times (0.587 \times G(x,y)+0.114 \times B(x,y))/(0.587 \times G(x',y')+0.114 \times B(x',y'))$$

$$r=YG+1.402 \times Cr$$

wherein Y is a luminance value of said second similar pixel, R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said second similar pixel, G(x,y) is said second G-signal of said fourth objective pixel, r is said third R-signal obtained by said R-interpolation processor, and YG is said modified luminance value.

20. A device according to claim 3, wherein said B-interpolation processor obtains said third B-signal, on the assumption that said color difference signals Cb and Cr of said first objective pixel are equal to said color difference signals Cb and Cr of said first similar pixel.

21. A device according to claim 3, wherein said R-interpolation processor obtains said third R-signal, on the assumption that said color difference signals Cb and Cr of said fourth objective pixel are equal to said color difference signals Cb and Cr of said second similar pixel.

22. A device according to claim 3, wherein said B-interpolation

processor obtains said third B-signal, using said first R-signal of said first objective pixel and said color difference signals Cb and Cr of said first similar pixel.

23. A device according to claim 22, wherein said B-interpolation processor obtains said third B-signal, according to the following formula.

$$Cb=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

$$b=1.293 \times R(x,y)+2.293 \times Cb-1.812 \times Cr$$

wherein R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said first similar pixel, R(x,y) is said first R-signal of said first objective pixel, and b is said third B-signal obtained by said B-interpolation processor.

24. A device according to claim 3, wherein said R-interpolation processor obtains said third R-signal, using said first B-signal of said fourth objective pixel and said color difference signals Cb and Cr of said second similar pixel.

25. A device according to claim 24, wherein said R-interpolation processor obtains said third R-signal, according to the following formula.

$$Cb=-0.169 \times R(x',y')-0.331 \times G(x',y')+0.5 \times B(x',y')$$

$$Cr=0.5 \times R(x',y')-0.419 \times G(x',y')-0.081 \times B(x',y')$$

$$r=0.773 \times B(x,y)-1.773 \times Cb+1.401 \times Cr$$

wherein R(x',y'), G(x',y'), and B(x',y') are said second R, first G, and second B-signals of said second similar pixel, B(x,y) is

said first B-signal of said fourth objective pixel, r is said third R-signal obtained by said R-interpolation processor.